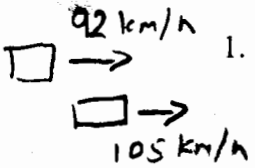
Frame of Reference

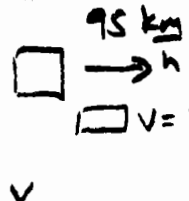


1. From the reference frame of a stationary observer, a car, traveling at a constant speed of 92 km/h, is passed by a truck moving at 105 km/h.
   a. From the point of view of the car, what is the truck's speed?

$$V_C = 105\ \frac{km}{h} - 92\ \frac{km}{h} = \boxed{1.3\times10^{1}\ \frac{km}{h}}$$

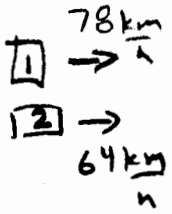
   b. From the point of view of the truck, what is the car's speed?

$$V_T = 92\ \frac{km}{h} - 105\ \frac{km}{h} = \boxed{-1.3\times10^{1}\ \frac{km}{h}}$$



2. As you travel at a constant 95 km/h, a car that you know to be 3.5 m long, passes you in 1.8 s. How fast is it going relative to Earth?

$$V_E = 95\ \frac{km}{h} + 7\ \frac{km}{h} = \boxed{1.02\times10^{2}\ \frac{km}{h}}$$



3. Two cars approach each other; both cars are moving westward, one at 78 km/h, the other at 64 km/h.
   a. What is the velocity of the first car relative to the frame of reference of the second car?

$$V_1 = 78\ \frac{km}{h} - 64\ \frac{km}{h} = \boxed{1.4\times10^{1}\ \frac{km}{h}}$$

   b. After they pass, will their relative velocity change?

VELOCITY DOES NOT CHANGE, JUST DIRECTION

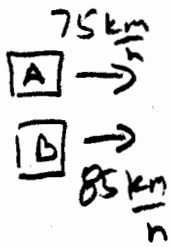
Review

d = ?
t = 0.75 s
V = 55 km/h × 1000m/1km × 1h/3600s = 15.28 m/s

4. Ann is driving down a street at 55 km/h. Suddenly a child runs into the street. If it takes Ann 0.75 s to react and apply the brakes, how many meters will she have moved before she begins to slow down?

$$V = \frac{d}{t} \qquad 15.28\ \frac{m}{s} = \frac{d}{0.75\ s}$$

$$\boxed{d = 2.04\times10^{1}\ m}$$



5. Both car A and car B leave school when a clock reads zero. Car A travels at a constant 75 km/h, while car B travels at 85 km/h.
   a. How far are the two cars from school when the clock reads 2 h?

A) $75\ \frac{km}{h} = \frac{d_A}{2h}$ $\quad \boxed{d_A = 1.50\times10^{2}\ km}$

$85\ \frac{km}{h} = \frac{d_B}{2h}$ $\quad \boxed{d_B = 1.70\times10^{2}\ km}$

   b. Both cars passed a gas station 100 km from the school. When did each car pass the station?

$$75\ \frac{km}{h} = \frac{100\ km}{t_A} \qquad \boxed{t_A = 1.33\ hr}$$

$$85\ \frac{km}{h} = \frac{100\ km}{t_B} \qquad \boxed{t_B = 1.18\ hr}$$